REMARKS

Claims 8-17 are pending. Claims 1-15 were rejected. Claims 1-7 have been canceled without prejudice. Claims 8-15 have been amended. New claims 16 and 17 have been added. No new matter has been added to the amended or new claims.

Reconsideration of the claims is respectfully requested.

Claim Rejections - 35 USC § 102

Claims 8-10 and 12-14 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,292,582 to Lin *et al.* (hereafter Lin). The Applicants respectfully disagree with the grounds for these rejections.

Claim 8

Lin

Lin appears to disclose a system and method for detecting and classifying anomalies or defects on semiconductor wafers. The method includes capturing and preparing a digital-pixel-based representation of a defect image followed by a symbolic decomposition of the digital-pixel-based image into a primitive-based representation. (Lin, Abstract). The primitive-based representation is analyzed, in comparison with primitives derived from a reference image, to classify the anomaly or defect. (Lin, Abstract).

The Present Invention

The present invention relates to sample observation methods and equipment intended to be used for an automatic method of closer inspection for a defect developed or a foreign material deposited during the production of semiconductors. (Abstract). The present invention provides sample observation methods and equipment that enable faster and efficient observation of a defect, solving problems present in the prior art. (Specification at page 3, line 18).

Claim 8

        Amended claim 8 recites, in part, "acquiring a defective sample image including the defect on the sample at a first scale factor with the imager, based on the information on the defect on the sample detected by the inspection apparatus" and "acquiring a magnified image of the located defect at a second scale factor greater than the first scale factor with the imager without moving the sample." Because the amended claim includes limitations not present in Lin, the Applicants believe the amended claim is patentably distinct from Lin.

        The claimed invention includes a step of "acquiring a defective sample image including the defect on the sample at a first scale factor with the imager, based on the information on the defect on the sample detected by the inspection apparatus." Thus, the first scale factor used by the imager in acquiring the defective sample image is based on information on the defect detected by the inspection apparatus. "The first scale factor is set so that the defect will fall within the field of view of the image pickup when the stage is moved [from the reference sample image location] to the defect location." (Specification at page 15, line 19). This limitation is not taught by Lin. The Lin reference does not show selection of a scale factor based on information on the defect detected by the inspection apparatus. Rather, Lin selects the scale factor based on system design parameters. For example, Lin appears to disclose that any wafer defect detector that "provides the location of each defect within a radius of 150x the width of the smallest defect to be detected may be used." (Lin at col. 24, lines 8-15, emphasis added). Therefore, the defect classification system disclosed by Lin acquires the defect image using a scale factor based on the smallest defect size to be detected by the system, not actual "information on the defect on the sample detected by the inspection apparatus" as recited, in part, by amended claim 8.

        Moreover, Lin does not teach or suggest "acquiring a magnified image of the located defect at a second scale factor greater than the first scale factor with the imager without moving the sample." The magnification of images performed using the

defect detection and classification systems taught by Lin is performed, not with an imager, but either in a symbolic primitive space or by electronic manipulation of previously captured images. Additionally, the defect repair system disclosed by Lin appears to capture only a single magnified image, not images at a first and second scale factor, as recited by amended claim 8.

After the systems discussed by Lin capture a defect image in a camera and convert it to an array of pixels, the image is decomposed into a primitives-based representation of the image. (Lin at col. 9, lines 47-65). Lin teaches that if "the primitive lengths in the reference image are not the same size as those of the current image, they can be scaled up or down proportionally until they match; this proportional adjustment gives the magnification level adjustment between the two images." (Lin at col. 14, lines 41-43). In an embodiment of an automatic defect repair system, "the symbolic representation of the image in the defect rectangle is magnified to match the magnification level of the repair unit image from which a symbolic representation is also rendered." (Lin at col. 26, lines 19-22 and Fig. 31, emphasis added). Therefore, rather than teaching "acquiring a magnified image of the located defect at a second scale factor greater than the first scale factor with the imager" as recited by the amended claim, Lin teaches that the magnification is performed in symbolic primitive space, not with the imager.

Lin appears to disclose a defect repair unit or tool, such as a MICRION 9800 ion beam machine, which is a separate piece of equipment from the wafer defect detector 460. (Lin, Fig. 27). The defect repair unit utilizes an automatic defect repair software "program [that] aligns and magnifies the original defect image so that it is superimposed over the repair unit image of the same defect." (Lin at col. 24, lines 47-54). This language appears to disclose a software system that retrieves a previously captured defect image from "an anomaly image file" and electronically manipulates the defect image in preparation for comparison with a magnified image captured by the defect repair system. (Lin at col. 24, lines 35-36). However, such electronic or software manipulations do not teach or suggest "acquiring a magnified image of the located defect

at a second scale factor greater than the first scale factor <u>with the imager</u>" as recited by the amended claim.

Lin appears to disclose that the defect repair unit, in step 444, generates "a magnified image of the defect area … to redetermine whether a defect is repairable." (Lin at col. 23:65-68, Fig. 26). Lin does not disclose whether this magnified image is generated in symbolic space or is captured by an imager. Therefore, Lin does not teach or suggest acquiring a magnified image of the located defect with the imager. However, even if the magnified defect image is captured with an imager, Lin does not teach or suggest that the defective sample image is acquired at a first scale factor with the imager and is acquired at a second scale factor greater than the first scale factor with the imager without moving the imager, as recited, in part, by the claimed invention. In fact, as discussed above, the Lin reference appears to disclose the acquisition of only a single magnified image in step 444, since electronic manipulation of the previously captured defect image is required to align and magnify the defect image for comparison with the magnified repair unit image.

Additionally, the magnification step of the claimed invention is performed "without moving the sample." Lin does not teach or suggest the claim limitation of acquiring a defective sample image at a first scale factor with the imager and acquiring a magnified image of the located defect at a second scale factor greater than the first scale factor with the imager <u>without moving the sample</u>." Because the first scale factor is selected so that the defect will fall within the field of view of the imager, it is not necessary to move the stage before the magnified image is acquired. (Specification at page 17, lines 5-14). This facilitates the operation of the wafer inspection apparatus in acquiring the magnified image at the second scale factor so that "the defective sample image of higher scale factor can be acquired efficiently." (Specification at page 17, lines 15-20). Therefore, although Lin appears to disclose acquiring a defect image, the reference does not teach or suggest acquiring a magnified defect image without moving the sample.

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For these reasons, among others, the Applicants respectfully submit that amended claim 8 is in a condition for allowance.

Claim 9

Amended claim 9 recites, in part, "acquiring a reference sample image not including any defect on a sample with an imager, based on information on a defect on the sample detected by an inspection apparatus; adjusting a position of the sample so that the defect will fall within the field of view of said imager, based on the information; acquiring a defective sample image including the defect on the sample at a first scale factor with said imager; and acquiring a magnified image of the located defect at a second scale factor greater than the first scale factor with said imager without changing the position of the sample."

As discussed in relation to claim 8, the "first scale factor is set so that the defect will fall within the field of view of the image pickup when the stage is moved [from the reference sample image location] to the defect location." (Specification at page 15, line 19). Lin does not teach or suggest the claim limitations of acquiring a defective sample image at a first scale factor when the position of the sample is adjusted based on information detected by an inspection apparatus so that the defect will fall within the field of view of said imager. Rather, the Lin reference selects the scale factor based on system design parameters. Moreover, as discussed above, Lin does not teach or suggest acquiring a defective sample image at a first scale factor and at a second scale factor greater than the first scale factor with an imager, without changing the position of the sample. For at least these reasons, the Applicants respectfully submit that amended claim 9 is in a condition for allowance.

Claim 10

Amended claim 10 is dependent on claim 9 and is believed to be patently distinct from the prior art for at least the reasons discussed with respect to claim 9. For these reasons, among others, the Applicants respectfully submit that amended claim 10 is in a condition for allowance.

Claim 12

Amended claim 12 recites, in part, an apparatus for observing samples, comprising: image pickup means; a position controller to control a position of the sample with respect to the image pickup means, based on the information stored in the storage means; and control means to locate a defect on the sample by comparing a plurality of images of the sample captured by the image pickup means at a first scale factor after the sample is positioned by the position controller and to control the image pickup means to acquire the located defect image at a second scale factor greater than the first scale factor without changing the position of the sample.

As discussed with respect to claim 8, Lin does not teach or suggest an image pickup means that captures images of the located defect at a first and second scale factor without changing the position of the sample. On the contrary, Lin teaches that magnification is performed either in the symbolic primitive space or by electronic manipulation of previously captured images. In an embodiment in which Lin may capture a magnified image using an image pickup mean, Lin appears to capture only a single magnified image, not acquiring images at a first and second scale factor without changing the position of the sample. For at least these reasons, the Applicants respectfully submit that amended claim 12 is in a condition for allowance.

Claim 13

Amended claim 13 recites, in part, an image pickup means for acquiring an image of the sample; position control means to control a position of the sample, based on the information stored in the storage means; defect locating means to locate the defect by comparing an image of the sample not including the defect and an image of the sample including the defect, wherein both of the images are acquired by the image pickup means at a first scale factor after the sample is positioned by the position control means; and display means to display an image of the defect located by the defect locating means and

captured by the image pickup means at a second scale factor that is greater than the first scale factor without changing the position of the sample.

As discussed with respect to claim 12, Lin does not teach or suggest an image pickup means that captures images of the located defect at a first and second scale factor without changing the position of the sample. For at least these reasons, the Applicants respectfully submit that amended claim 13 is in a condition for allowance.

Claim 14

Amended claim 14 recites, in part, an image pickup means; position control means to control a position of the sample so that a defect on the sample will fall within the field of view of the image pickup means, based on information on the defect on the sample detected by an external defect inspection apparatus; defect locating means to locate the defect by comparing an image of the sample not including the defect and an image of the sample including the defect, wherein both of the images are acquired by the image pickup means at a first scale factor after the sample is positioned by the position control means; and display means to display an image of the defect located by the defect locating means and captured by the image pickup means at a second scale factor that is greater than the first scale factor without changing the position of the sample.

As discussed with respect to claim 9, among others, Lin does not teach or suggest setting the first scale factor, based on information detected by an external defect inspection apparatus, so that a defect will fall within the field of view of the image pickup means. Rather, the Lin reference selects the scale factor based on system design parameters. Additionally, as discussed above, Lin does not teach or suggest an image pickup means that captures images of the located defect at a first and second scale factor without changing the position of the sample. For at least these reasons, the Applicants respectfully submit that amended claim 14 is in a condition for allowance.

Claim Rejections - 35 USC § 103

Claims 11 and 15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Lin. The Applicants respectfully disagree with the grounds for these rejections.

Claim 11, which depends on any one of claims 8, 9, and 10, is believed to be in a condition for allowance for at least the reasons stated regarding claims 8, 9, and 10. Therefore, Applicants respectfully submit that claim 11 is in a condition for allowance.
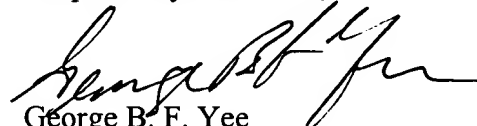
Claim 15, which depends on any one of claims 12, ,13, and 14, is believed to be in a condition for allowance for at least the reasons stated regarding claims 12, ,13, and 14. Therefore, Applicants respectfully submit that claim 15 is in a condition for allowance.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,

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